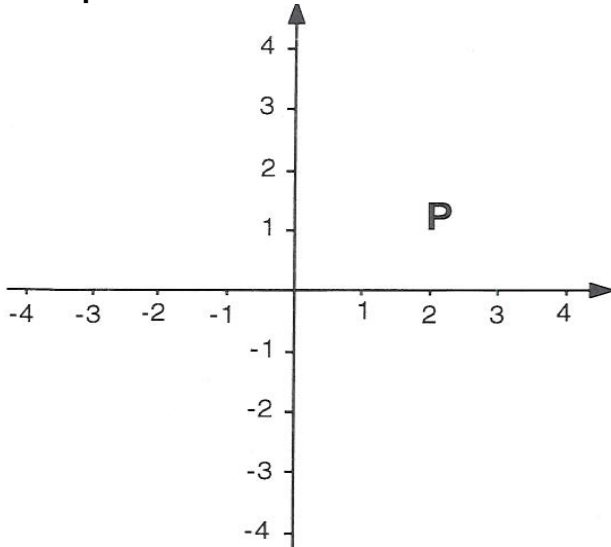


TRANSLATIONS AND ENLARGEMENTS

TRANSLATIONS

Translation means moving a figure either horizontally, vertically or horizontally and vertically.

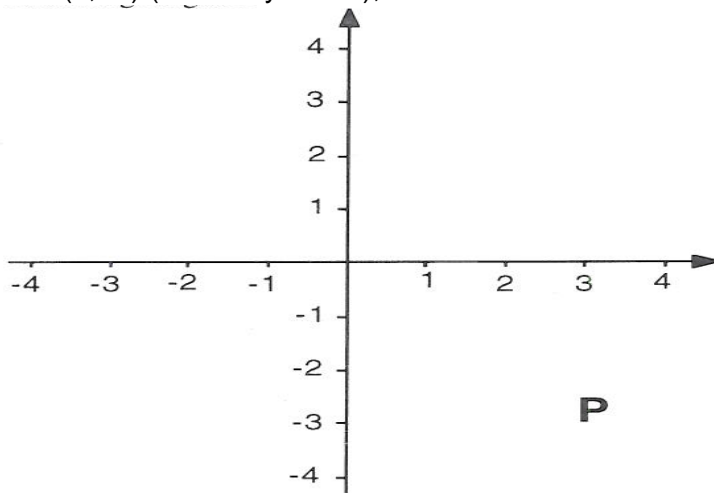
Example 1



The foot of the letter **P** is located at the point (2, 1) ($x=2, y=1$)

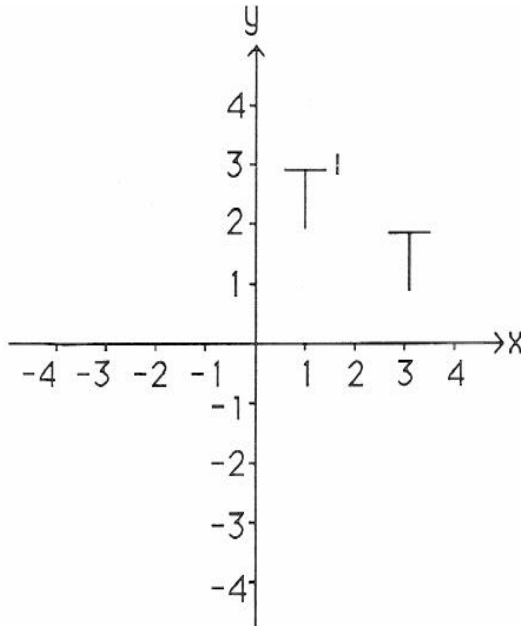
Redraw the letter **P** after a translation of $\begin{pmatrix} 1 \\ -4 \end{pmatrix}$ has been applied

$\begin{pmatrix} 1 \\ -4 \end{pmatrix}$ means move the letter 1 unit horizontally i.e. along the x axis in the positive direction as +1 and 4 units vertically i.e. along the y axis in the negative direction as -4. The letter **P** will now be found at the point (3, -3) ($x=2+1, y=1-4$), and this is shown on the following diagram



Example 2

What translation has taken T to T¹?

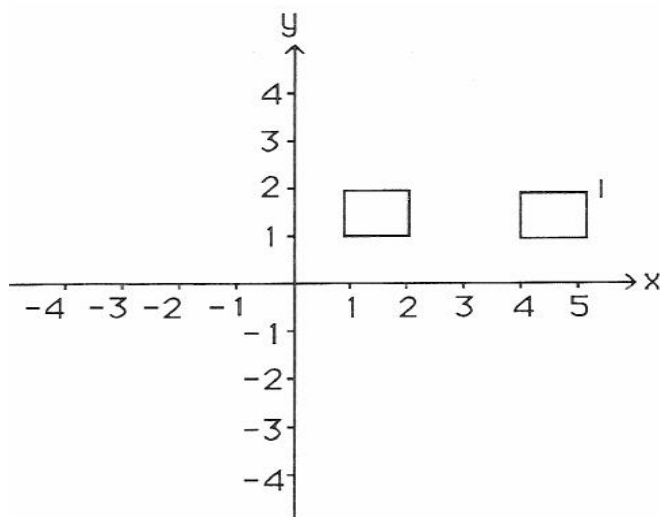


To find the position T¹ we moved 2 units along the *x* axis to the left i.e. in the negative direction followed by one unit upwards in the *y* direction

Therefore:- The translation can be described as $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$

Example 3

What translation has taken □ to □¹



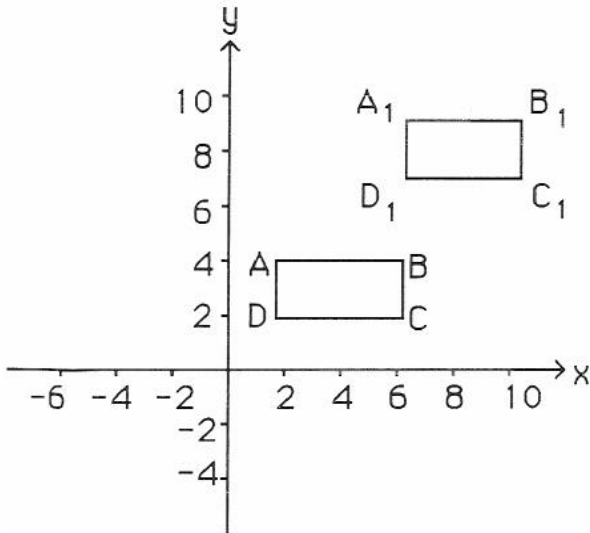
To find □¹ we moved 3 units along the axis to the right i.e. in the positive direction followed by **no** movement up or down

Therefore:- The translation can be described as $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$

Example 4

Draw the rectangle ABCD, where A is the point (2, 4) B (6,4), C is (6,2) and D is (2, 2)

Where is the image of ABCD under the translation $\begin{pmatrix} 4 \\ 5 \end{pmatrix}$?

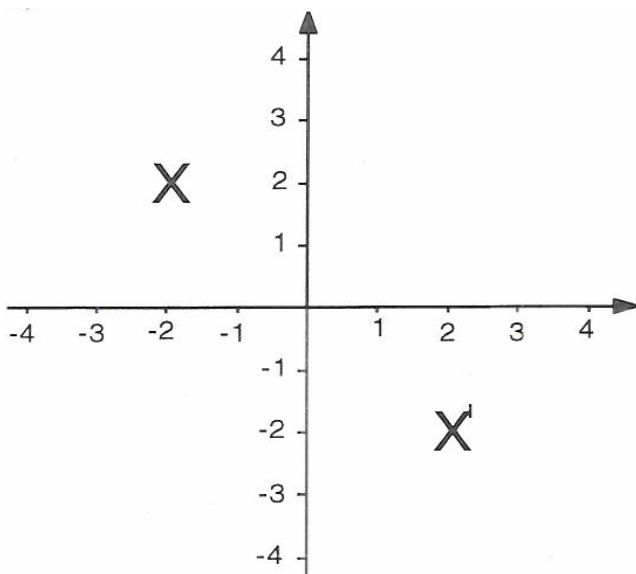


The translation $\begin{pmatrix} 4 \\ 5 \end{pmatrix}$ means every corner of the rectangle is moved 4 along and 5 up.

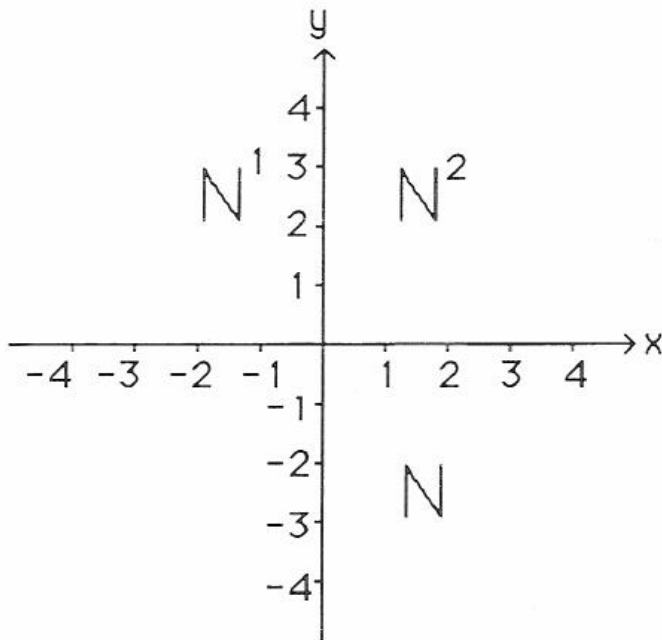
- i.e. A becomes $(2 + 4, 4 + 5)$ (6,9)
 B becomes $(6 + 4, 4 + 5)$ (10, 9)
 C becomes $(6 + 4, 2 + 5)$ (10, 7)
 D becomes $(2 + 4, 2 + 5)$ (6, 7)

Exercise 1

1. What translation has taken X to X'?

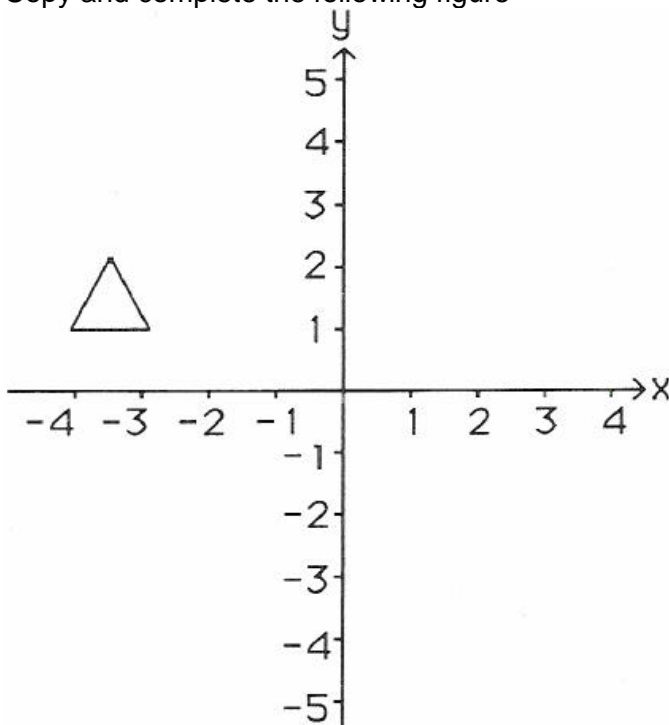


2.



- i) What translation has taken N to N¹?
- ii) What translation has taken N to N²?
- iii) What translation has taken N¹ to N²?

3. Copy and complete the following figure



- i) Draw in the position of the Δ when it undergoes a translation of 2 units parallel to the y axis in a positive direction.
- ii) Draw in the position of the Δ when it undergoes a translation of 5 units parallel to the x axis in a positive direction.

4. The vertices of a rectangle ABCD are (1, 3) (4,3) (4, 1) and (1, 1) respectively.

Put this information on a diagram. Where is the image of ABCD under the translation $\begin{pmatrix} 4 \\ 5 \end{pmatrix}$?

5. On the same axes, draw the image of the point (4, 5) after a translation of:

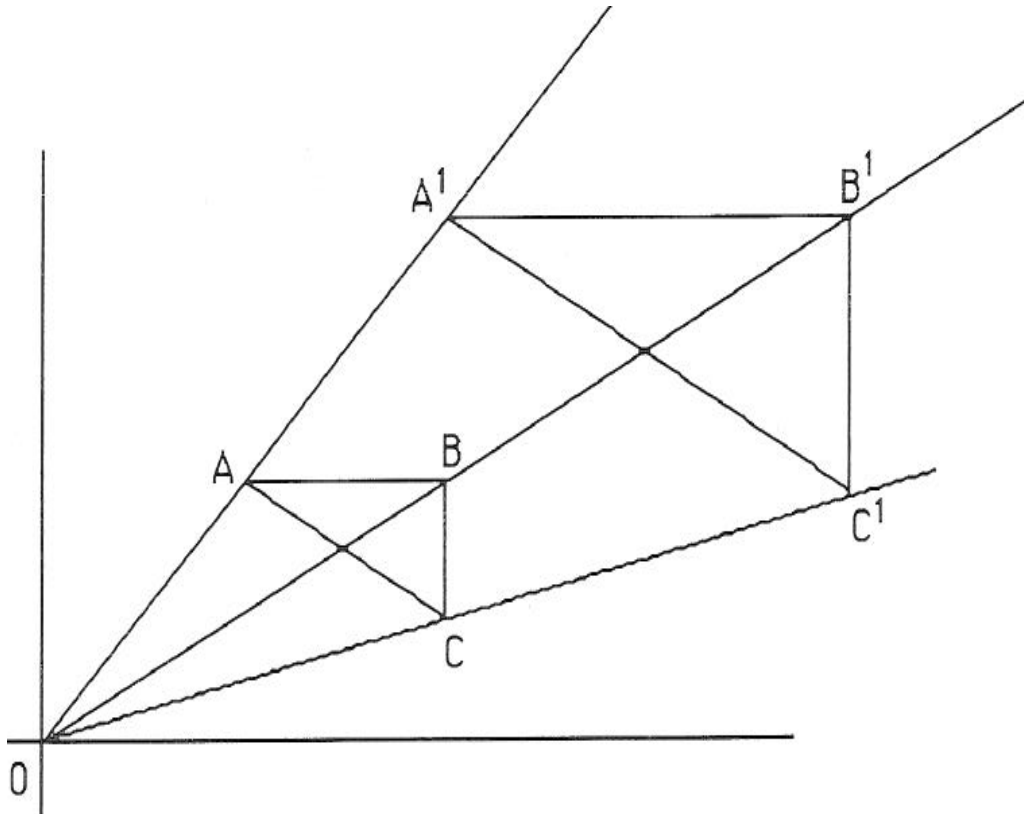
i) $\begin{pmatrix} 2 \\ 6 \end{pmatrix}$ ii) $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$ iii) $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$ iv) $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$

ENLARGEMENTS

When something is enlarged the shape of the object remains the same but the lengths of **all** its sides are increased or decreased by the same ratio

Example 1

Draw the enlargement of the triangle ABC with a scale factor of 2 from the centre of O.



- i) Draw in the lines OA, OB and OC and extend them as shown,
- ii) Measure OA and mark it A¹.
- iii) Measure OB, Multiply it by 2.
- iv) Measure this distance along the line OB and mark it B¹.
- v) Repeat this for C¹.
- vi) Join up A¹ B¹ C¹.

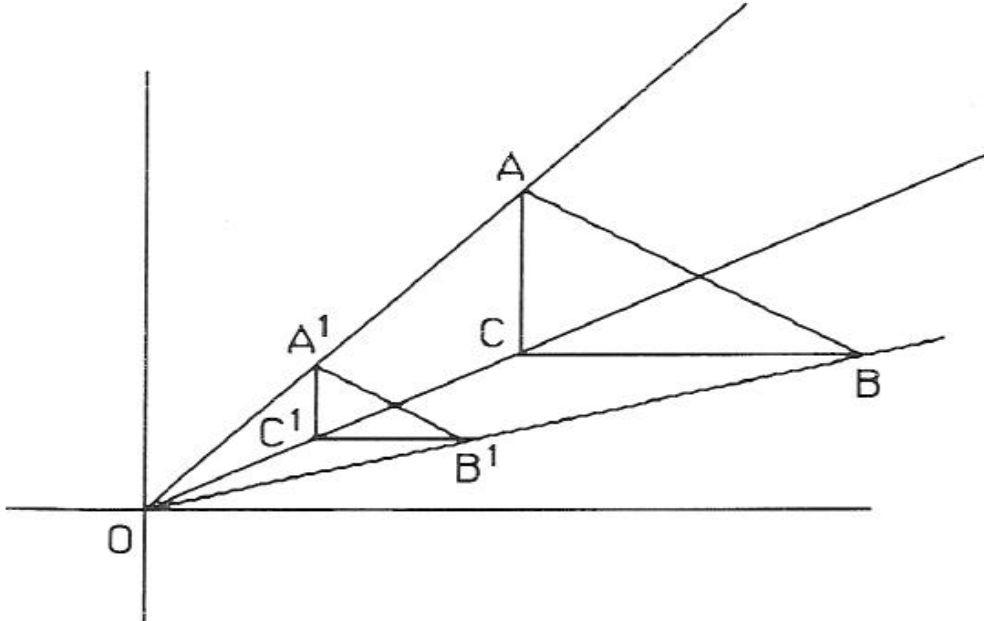
This is the enlarged triangle.

NOTE

An enlargement is described by two things:

- i) The scale factor
- ii) The centre of the enlargement

Draw the enlargement of the triangle ABC using a scale factor of $\frac{1}{2}$ from the centre



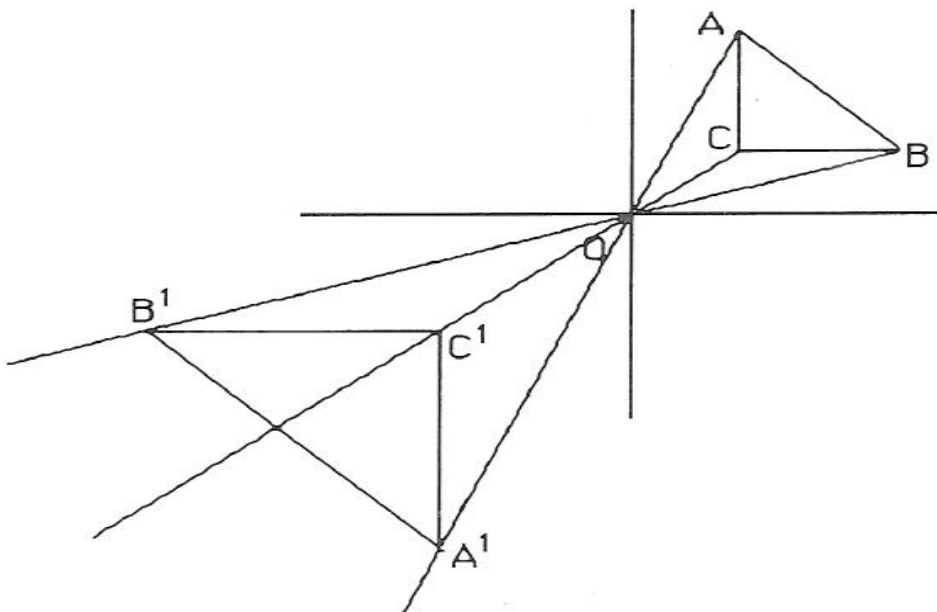
As before join OA, measure OA, then half this measurement (scale factor $\frac{1}{2}$) and mark A', Repeat for B' and C'.

NOTE

The word “enlargement” is still used even though there is a decrease in size.

Example 3

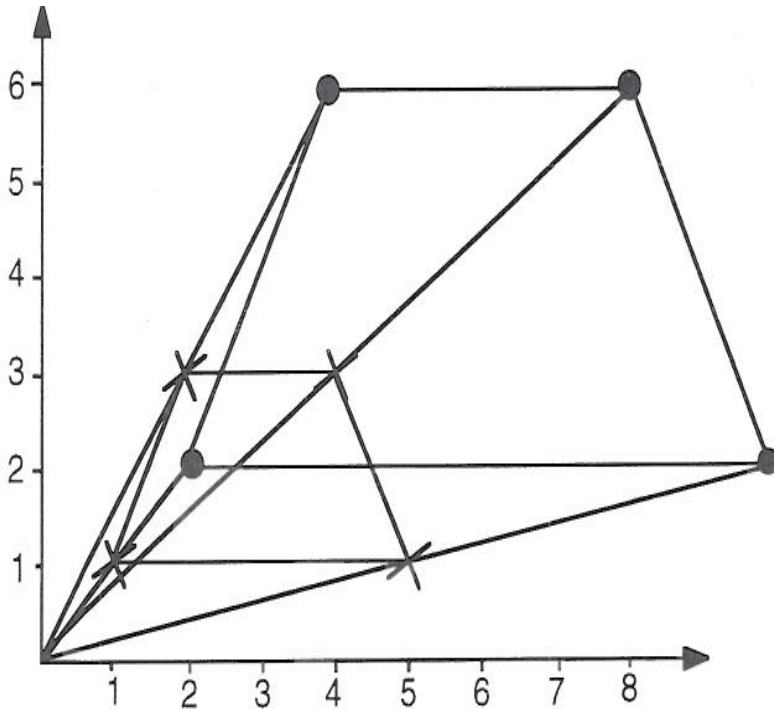
Draw the enlargement of the triangle ABC using a scale factor of -2 from the centre



- i) This time join AO and extend the line "backwards" as shown. (This is because of the minus sign).
- ii) Measure AO, multiply by 2, then mark A^1 .
- iii) Repeat for B^1 and C^1 .

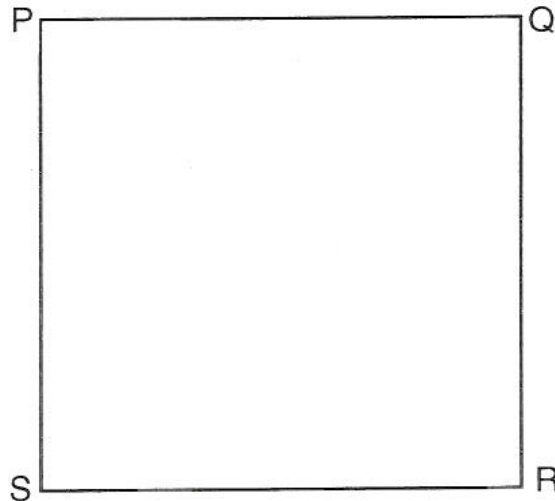
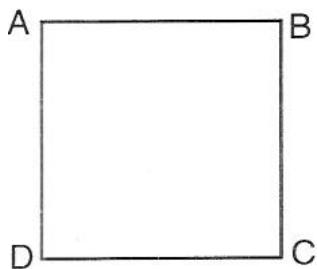
Example 4

Draw the figure having the following coordinates (1, 1) (5, 1) (4, 3) and (2, 3). Name the shape, enlarge the shape by a scale factor of 2 centred on the origin.



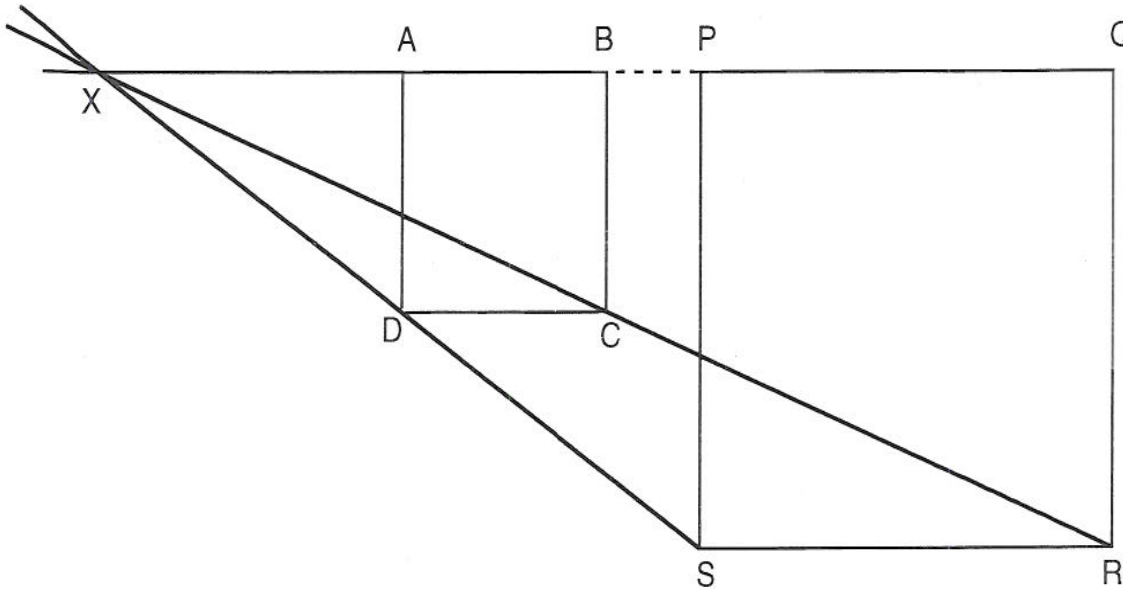
The shape is a trapezium

Example 5



ABCD is enlarged to become PQRS. What is the scale factor of enlargement and what is the centre of enlargement?

First join the corresponding vertices with straight lines as shown: P to A, Q to B, S to D, R to C and extended backwards.



NOTE

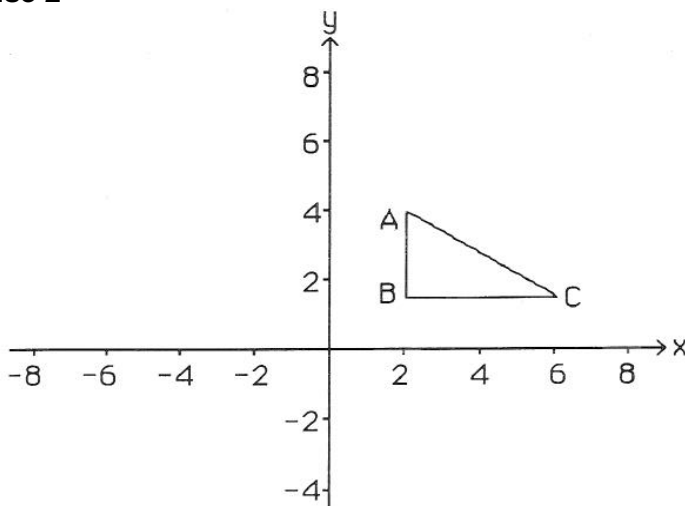
Line QP extended backwards goes over BA. All lines should meet at a point. This is the centre of enlargement.

To find the scale factor of enlargement measure X to A and X to P.

	2cm to 4cm
\ Enlargement	2 : 4
	1 : 2

i.e. Twice as big.

Exercise 2



Enlarge the triangle ABC by

- a) a factor of 2
- b) a factor of $\frac{1}{2}$
- c) a factor of -1

using the origin as the centre of enlargement.

ANSWERS

Exercise 1

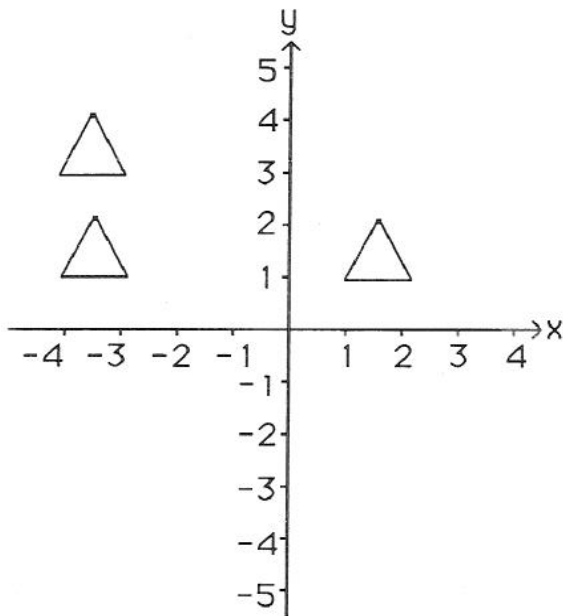
1. $\begin{pmatrix} 4 \\ -4 \end{pmatrix}$

2. i) $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$

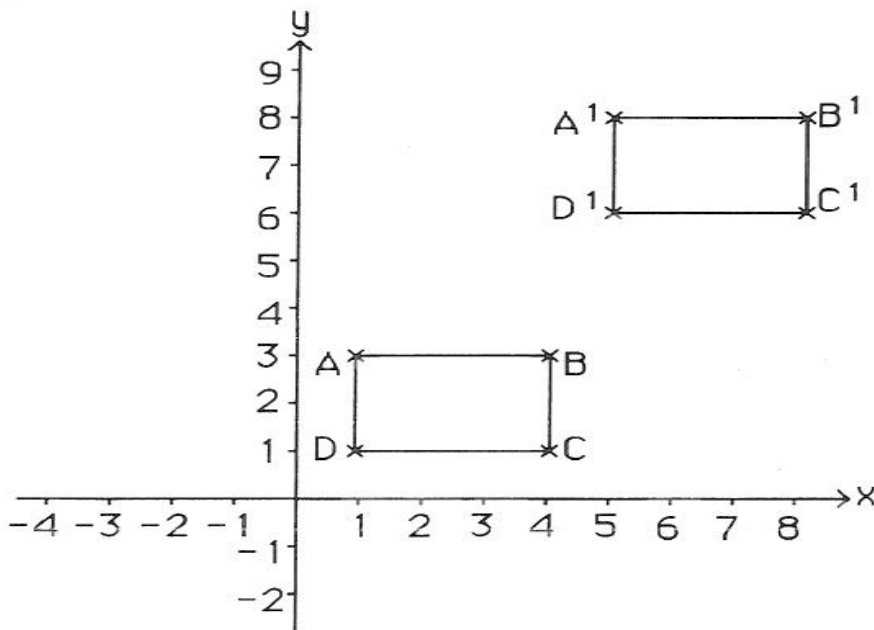
ii) $\begin{pmatrix} 0 \\ 5 \end{pmatrix}$

iii) $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$

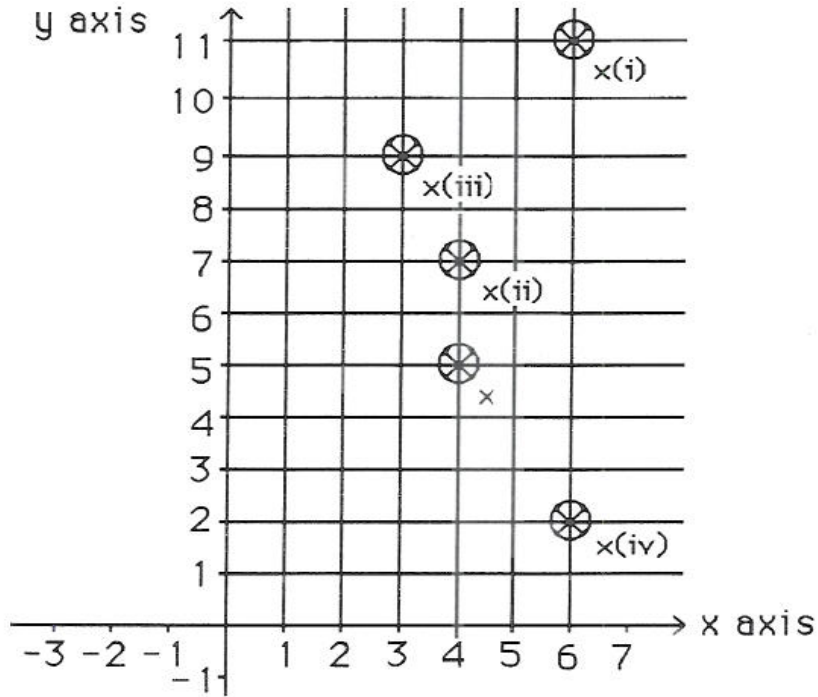
3.



4.



5.



Exercise 2

